

The background of the slide is a photograph of a river flowing under a bridge. The river is surrounded by trees with vibrant autumn foliage in shades of yellow, orange, and green. The bridge is a simple steel truss structure. The sky is visible in the upper right corner, showing some clouds.

PROJECT KICKOFF MEETING

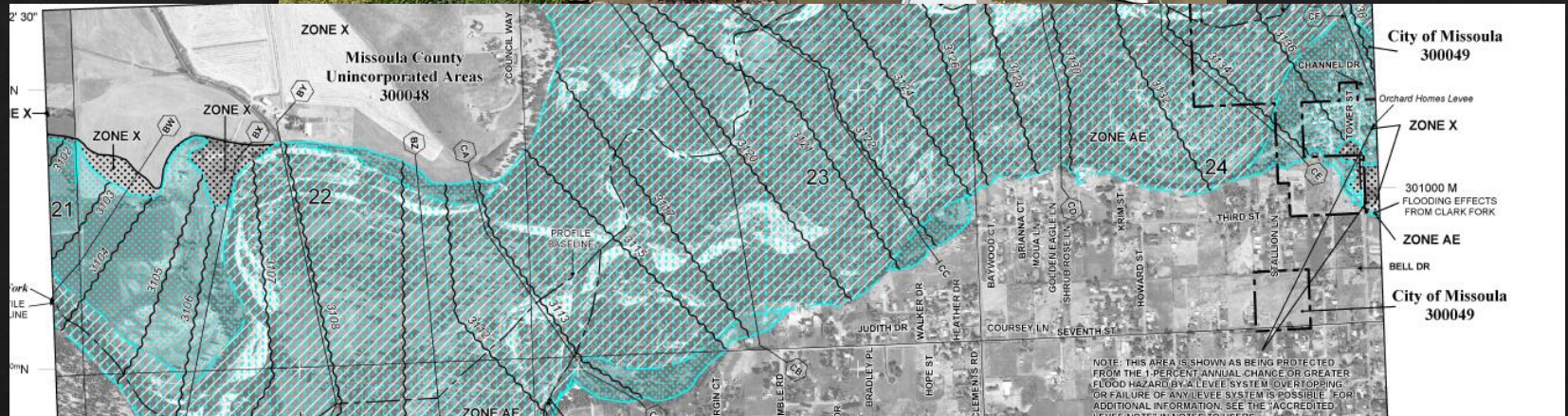
Missoula County Floodplain Mapping Project

October 23, 2019

Purpose:

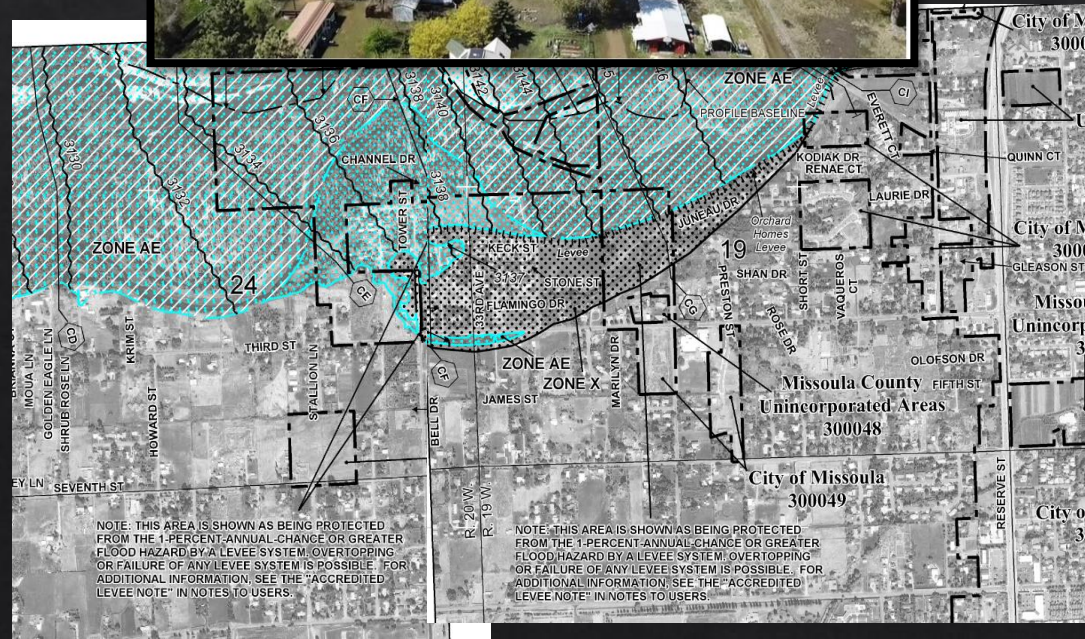
- Project Overview
- Review Project Team, Scope & Schedule
- Levee certification/accreditation
- Questions & Discussion

Identifying risk through mapping



Flood Insurance Rate Maps

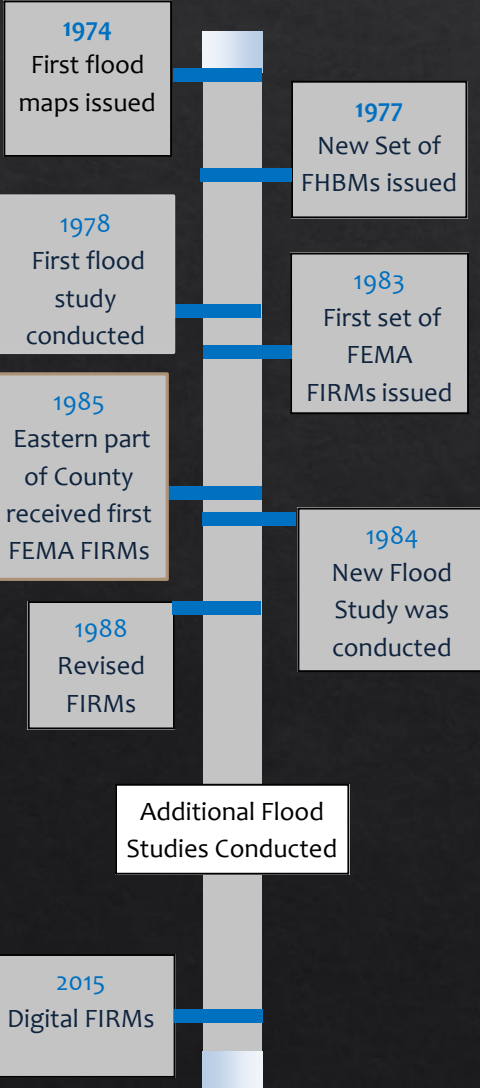
- ◆ Used for various purposes
 - ◆ Local floodplain regulations
 - ◆ Flood insurance premiums
 - ◆ Local emergency planning
- ◆ Need periodic updating



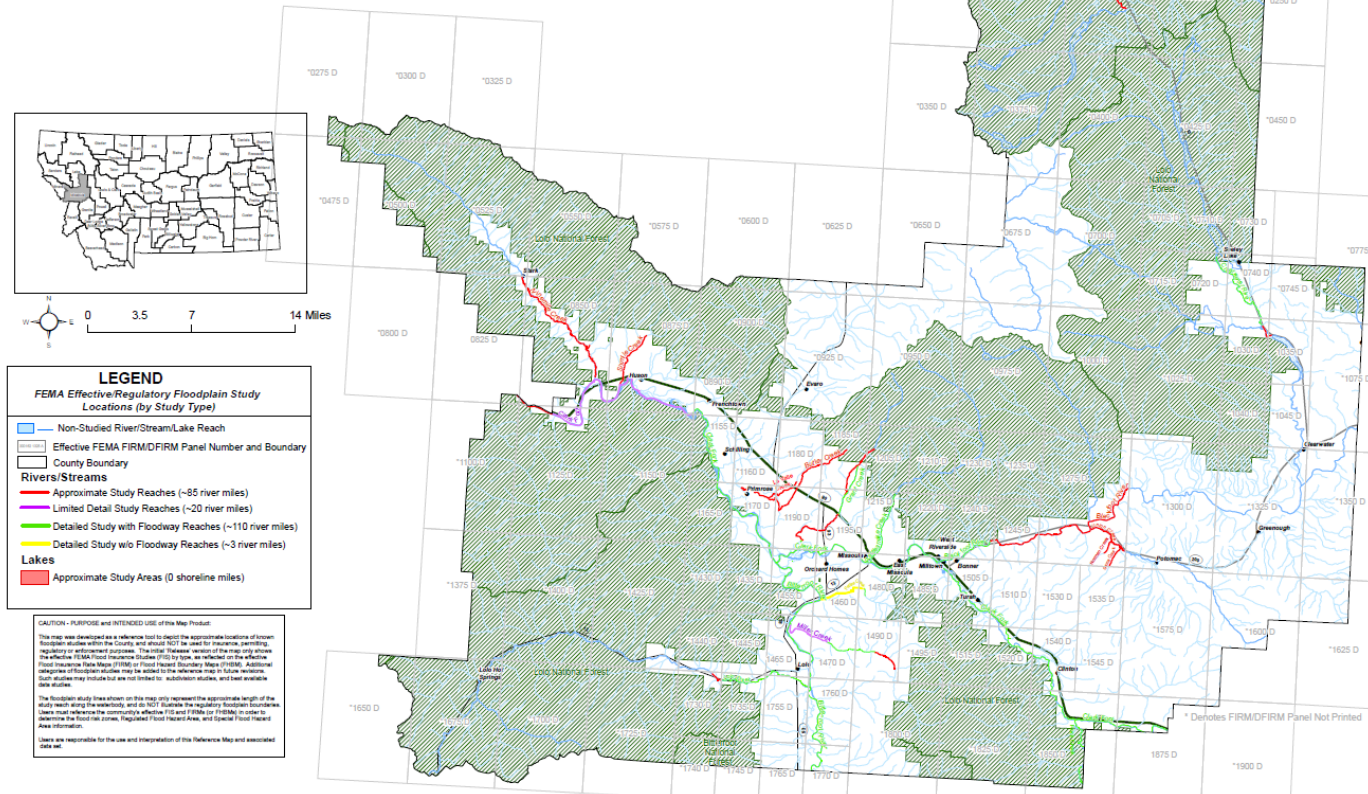
Missoula County - Floodplain Maps

◆ 2015 Flood Insurance Rate Maps

◆ Based off data collected in 80s



FLOODPLAIN STUDY REFERENCE MAP MISSOULA COUNTY, MONTANA (Community #30063C) DRAFT

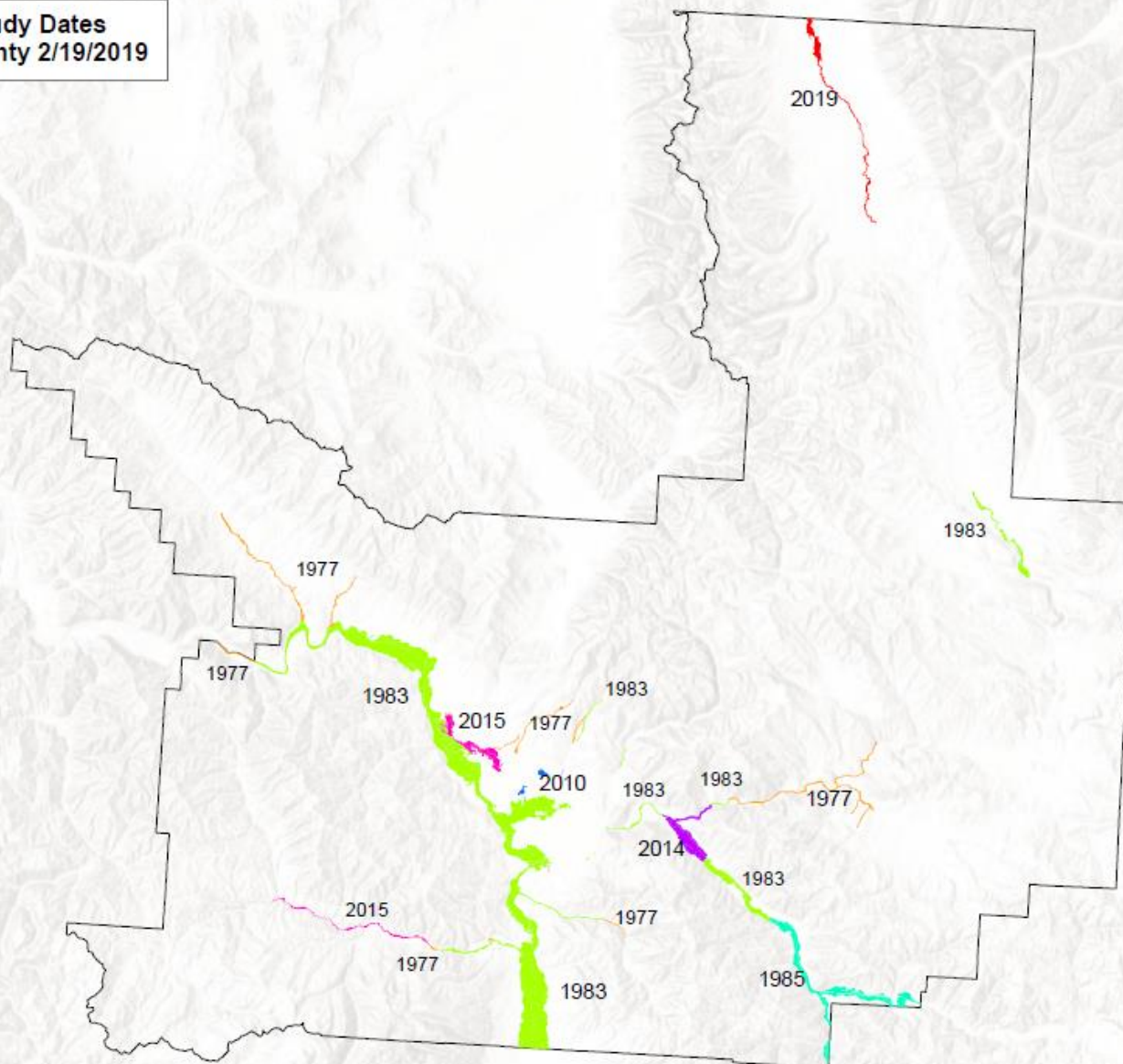


Missoula County Flood Study Dates
Provided by Missoula County 2/19/2019

Legend

Flood Study Year

- 1977
- 1983
- 1985
- 2010
- 2014
- 2015
- 2019



Sources: Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, G and the GIS user community

City of Missoula- Existing Floodplain Maps

NFP

PANEL 1480E

FIRM
FLOOD INSURANCE RATE MAP
MISSOULA COUNTY,
MONTANA
AND INCORPORATED AREAS


PANEL 1480 OF 1900
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

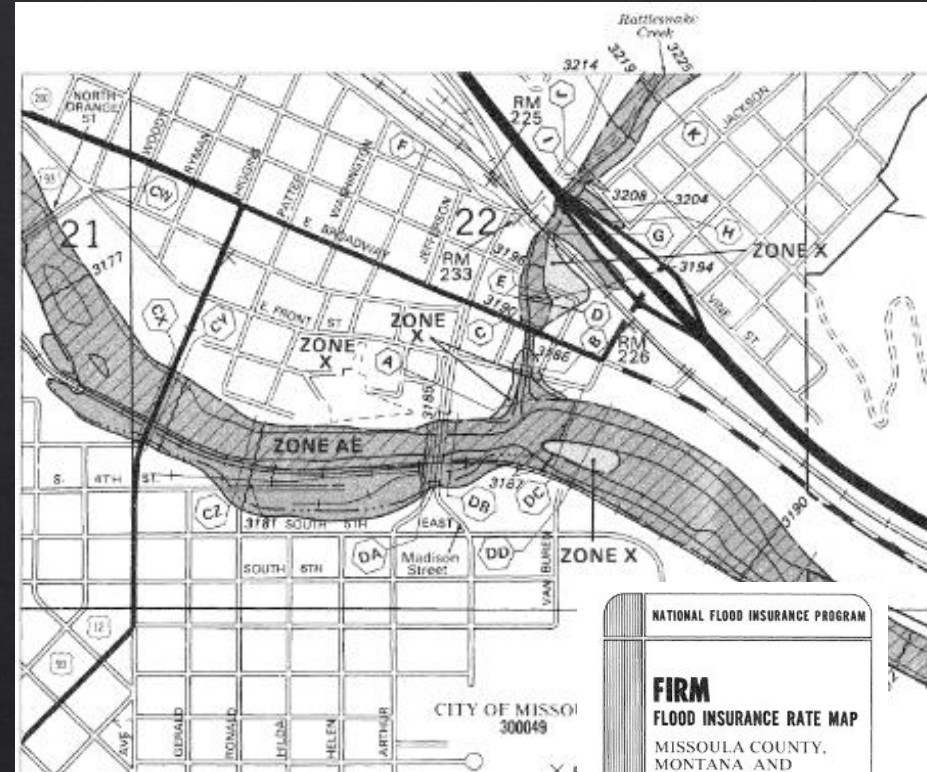
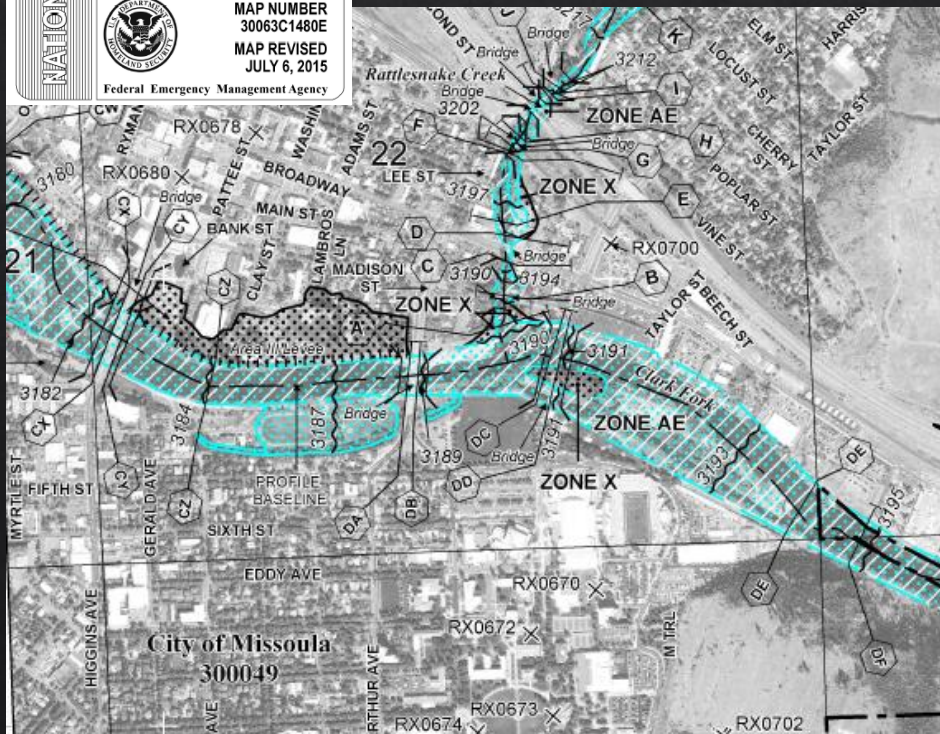
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MISSOULA, CITY OF	300049	1480	E
MISSOULA COUNTY Unincorporated Areas	300048	1480	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
30063C1480E
MAP REVISED
JULY 6, 2015


 **Federal Emergency Management Agency**



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
MISSOULA COUNTY,
MONTANA AND
INCORPORATED AREAS

PANEL 1480 OF 1900




PANEL LOCATION

CONTAINS:

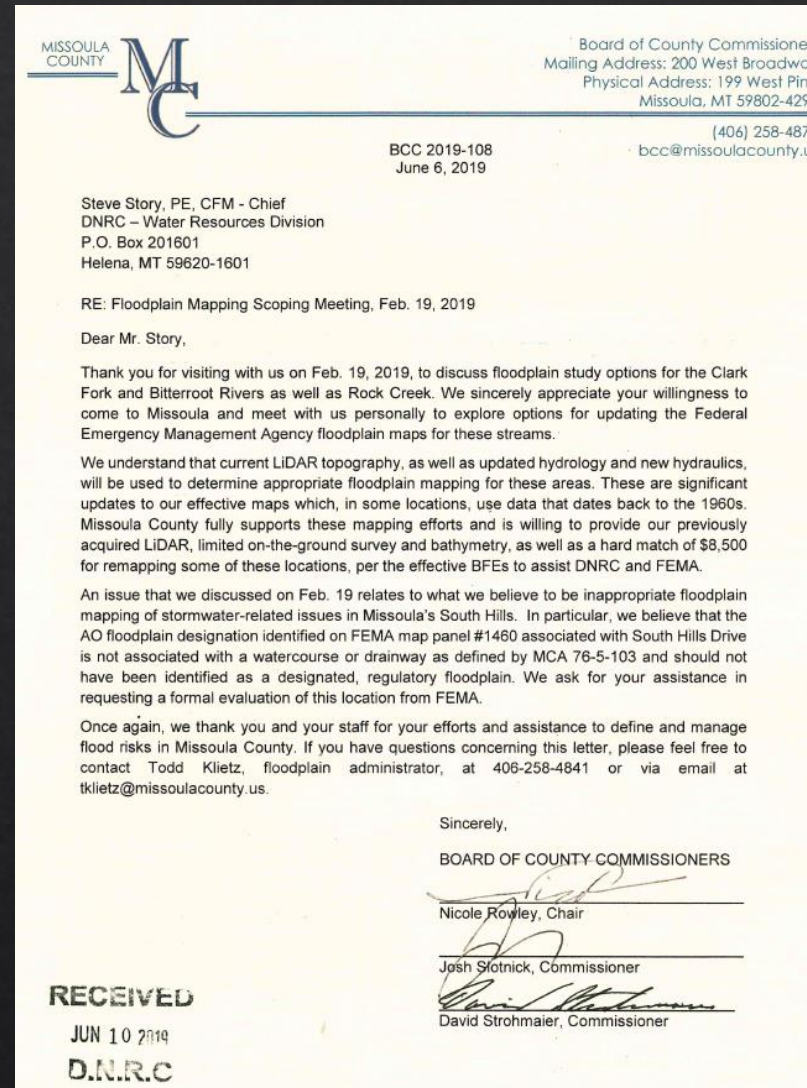
COMMUNITY	NUMBER	PANEL	SUFFIX
MISSOULA, CITY OF	300049	1480	E
UNINCORPORATED AREAS	300048	1480	D

MAP NUMBER
30063C1480 D
EFFECTIVE DATE:
AUGUST 16, 1988

 **Federal Emergency Management Agency**

Project Background

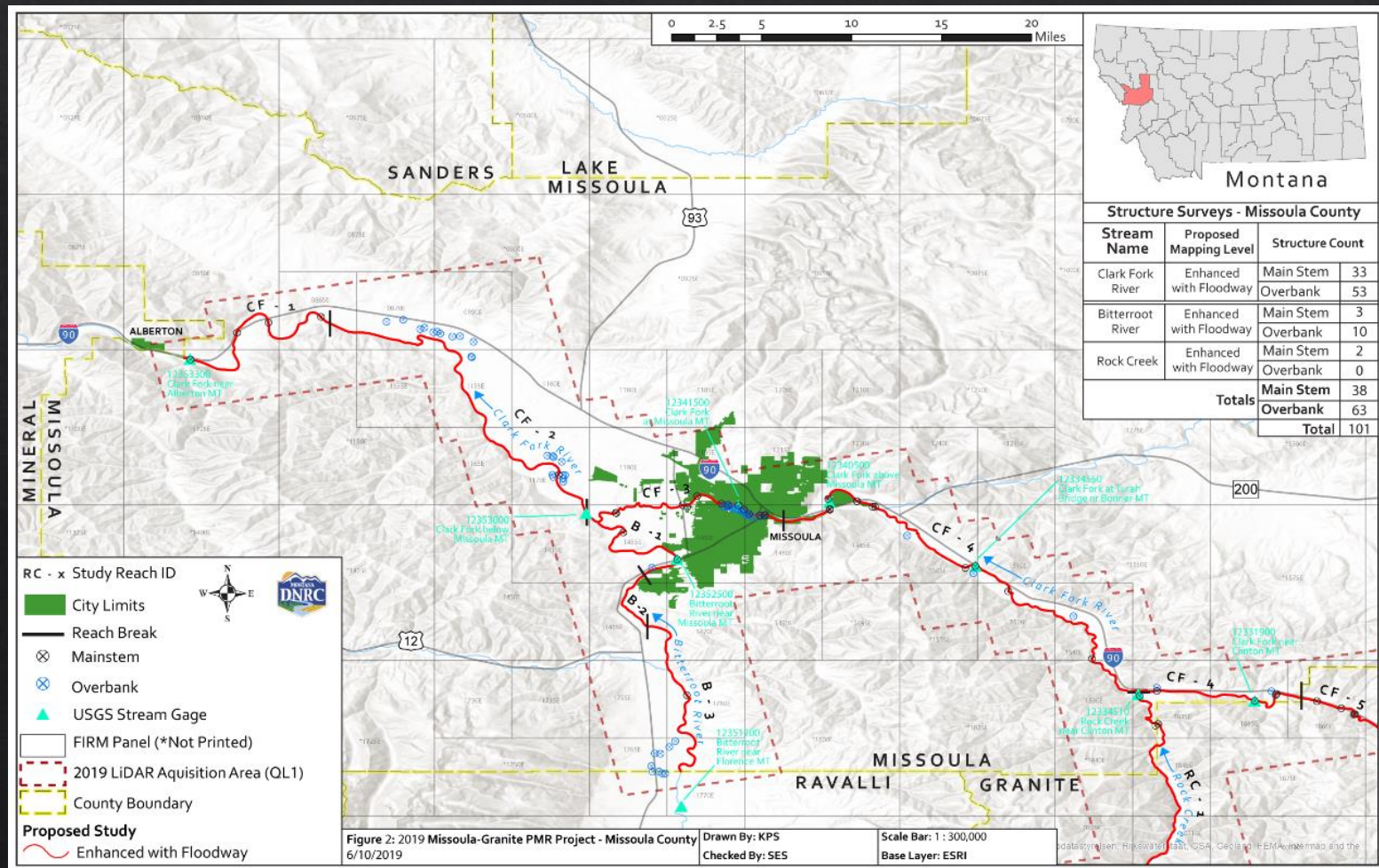
- ❖ **Pre 2019-** County expressed a need for a new study
- ❖ **June 2019**– County submitted support Letter to DNRC to update floodplain maps
- ❖ **July 2019** – LiDAR collection began
- ❖ **July 2019** – DNRC applied for FEMA grant for Missoula County
- ❖ **September 2019** – FEMA grant awarded; contractor selection and contracts
- ❖ **Fall 2019** – Missoula County Project underway



Missoula County Floodplain Mapping Project

Update 93 stream miles enhanced with floodway

Project Funding:
\$2,600,000 FEMA
\$22,500 DNRC
\$8,500 Missoula County



Project Team – Missoula County project

- ◆ DNRC Floodplain Staff – Tiffany Lyden, Nadene Wadsworth, Steve Story, Katie Shank, Doug Brugger, Worby McNamee, Traci Sears



- ◆ Missoula County  City of Missoula 

- ◆ FEMA Region VIII



- ◆ DNRC Contractors:

- ◆ Topography/LiDAR – Quantum Spatial



- ◆ Survey Work– Bathymetric survey-DOWL



Structure survey- Pioneer

- ◆ Hydrology- USGS and Pioneer



- ◆ Hydraulic Analysis and Floodplain Mapping

Rock Creek –



Bitterroot-

Clark Fork- Allied Engineering



Please contact DNRC, or County if there questions not our contractors

Understanding the Flood Study Process

Photo taken

Flood Study Steps

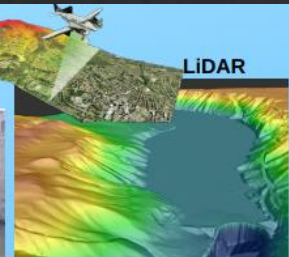
Step 1 - Survey: measurements are made of the topography around the river, along with any culverts, bridges, and road crossings. LiDAR uses an airplane to collect ground elevation over a large area, and ground survey supplements the airborne data.

Step 2 - Hydrology: determines how much water there will be in the river during a flood event. Data from stream gages will tell how many cubic feet of water per second the river will carry during the flood.

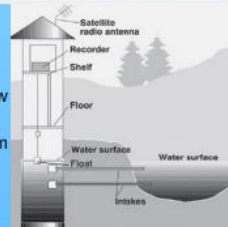
Step 3 - Hydraulics: once the first two steps are complete, calculations can show where the water will go during the flood. The elevation data is combined with the flood flow data to determine where the water will go when it overflows the channel.

Step 4 - Mapping (delineation): the results from step 3 are combined with the elevation data and official maps to see how far the water will spread out. The area shown to be underwater during the flood is the regulatory floodplain.

Step 1 - Survey: The type of the survey depends on the size of the study area and type of study.



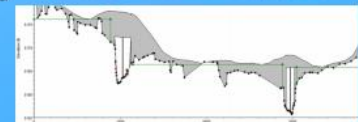
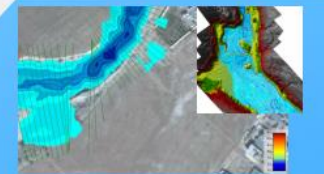
Step 2 - Hydrology: Stream gage stations are an important tool to determine flow rates. If nearby stream gages aren't available, gage data from a similar location is used to determine the flow rate.



Step 3 - Hydraulics:

5 main components to the model

- 1) Hydrology (stream flow data)
- 2) Cross Sections (measurements of the river bottom at key locations)
- 3) Roughness (thickness of vegetation, land cover, etc determined by surveyors)
- 4) Structures (road crossings, culverts, bridges, etc.)
- 5) Downstream conditions



Step 4 - Mapping (delineation):

The result will be the floodplain boundary and a depth grid identifying the shallower and deeper areas of flooding.



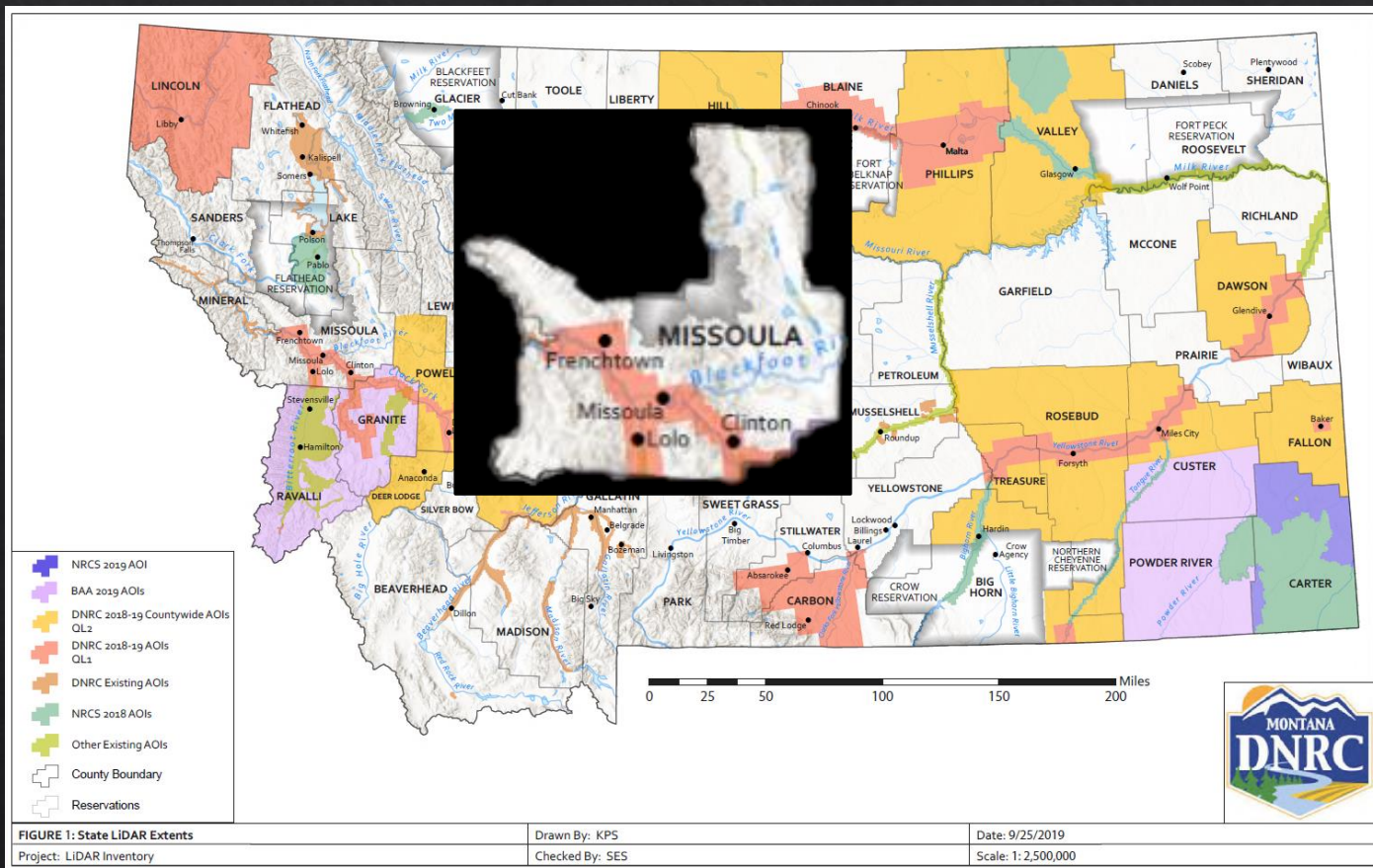
Project Scope

Topographic Data Collection



◆ Lidar Data Acquisition:

- ◆ LiDAR uses an airplane to collect ground elevation over a large area, and Ground Survey supplements the airborne data.



Project Scope

Survey Work

Provides in-stream and bridge/crossing data needed for hydraulic modeling and floodplain mapping.



**Engineering and
Environmental Services**

September 27, 2019

«AddressBlock»

Dear Landowner,

The Montana Department of Natural Resources and Conservation (DNRC) has hired our firm to conduct survey work in Missoula and Granite Counties. The work includes surveying bridges and diversion structures along the Clark Fork River, the Bitterroot River, Rock Creek, and select tributaries. This survey work is one of the first steps needed to develop flood studies and will eventually be used to update the existing floodplain maps, providing more accurate and current information. You can find more information on understanding the flood study process on the DNRC's website: www.floodplain.mt.gov/floodstudy.

We are sending you this courtesy notice because you have been identified as a landowner in the study area where field work may be performed. Survey crews plan to start in October with work continuing as long as weather permits. If we do not get to your property before winter weather shuts down the work, we will send a follow-up letter in the spring to inform you that work has started again.

If you do not wish that our survey personnel be on your property, or if you would like to be contacted by phone or email prior to survey personnel being on your property, please notify us by contacting George Austiguy with Pioneer using the contact information below.

If you have any other questions or would like more information regarding this project, please contact Nadene Wadsworth with the DNRC using the contact information below.

Thank you



Pioneer Technical Services, Inc.
George Austiguy P.E.
Project Manager
106 Pronghorn Trail
Bozeman, MT 59718
gaustiguy@pioneer-technical.com
406 723-1981



The Montana Department of
**Natural Resources
& Conservation**

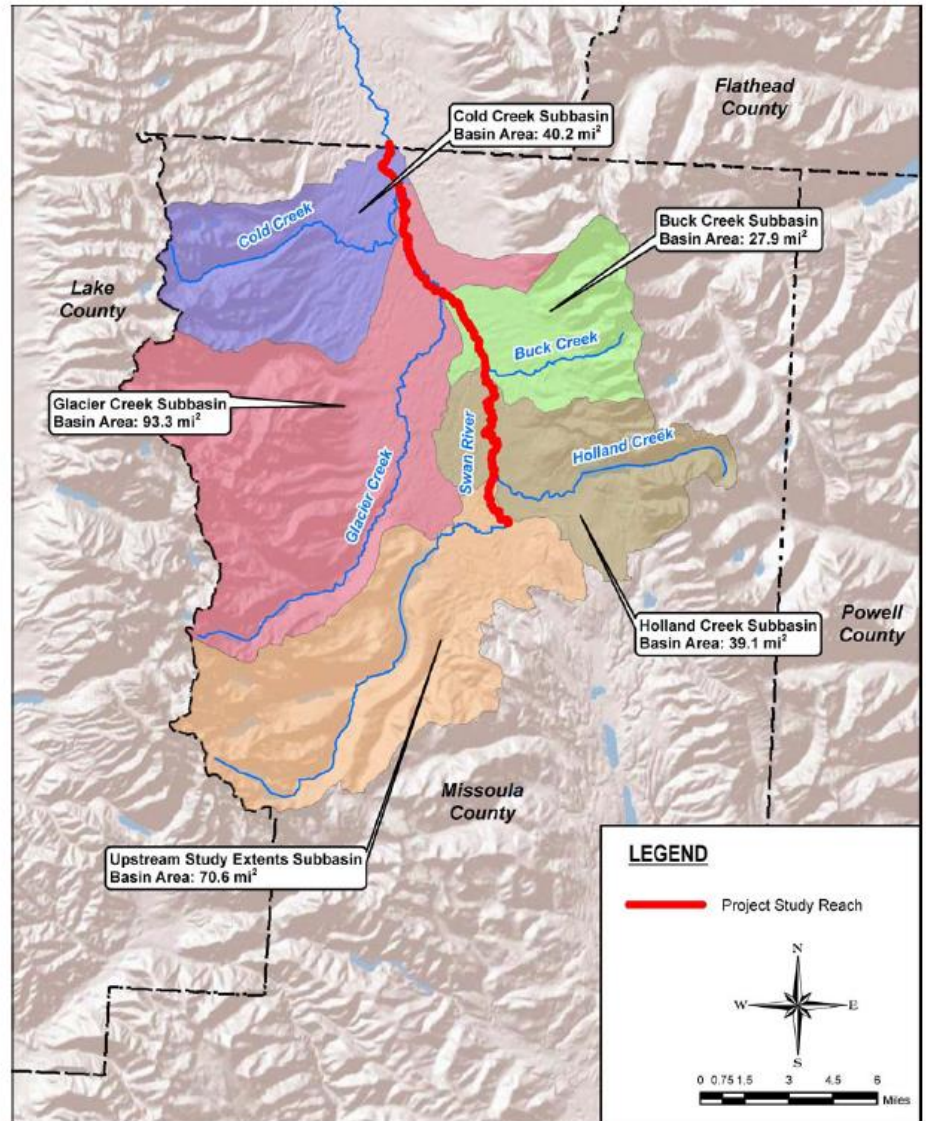
Dept. of Natural Resources and Conservation
Nadene Wadsworth, Outreach Specialist
DNRC Floodplain Management Program
1424 9th Ave.
Helena, MT 59601
Nadene.Wadsworth@mt.gov
(406) 444-6732

Project Scope

Hydrology

Determines how much water there will be in the river during a flood event. Data from stream gages will tell how many cubic feet per second the river will carry.

Figure 3: Drainage Basin Area



Project Scope

Hydraulic Analysis and Floodplain Mapping

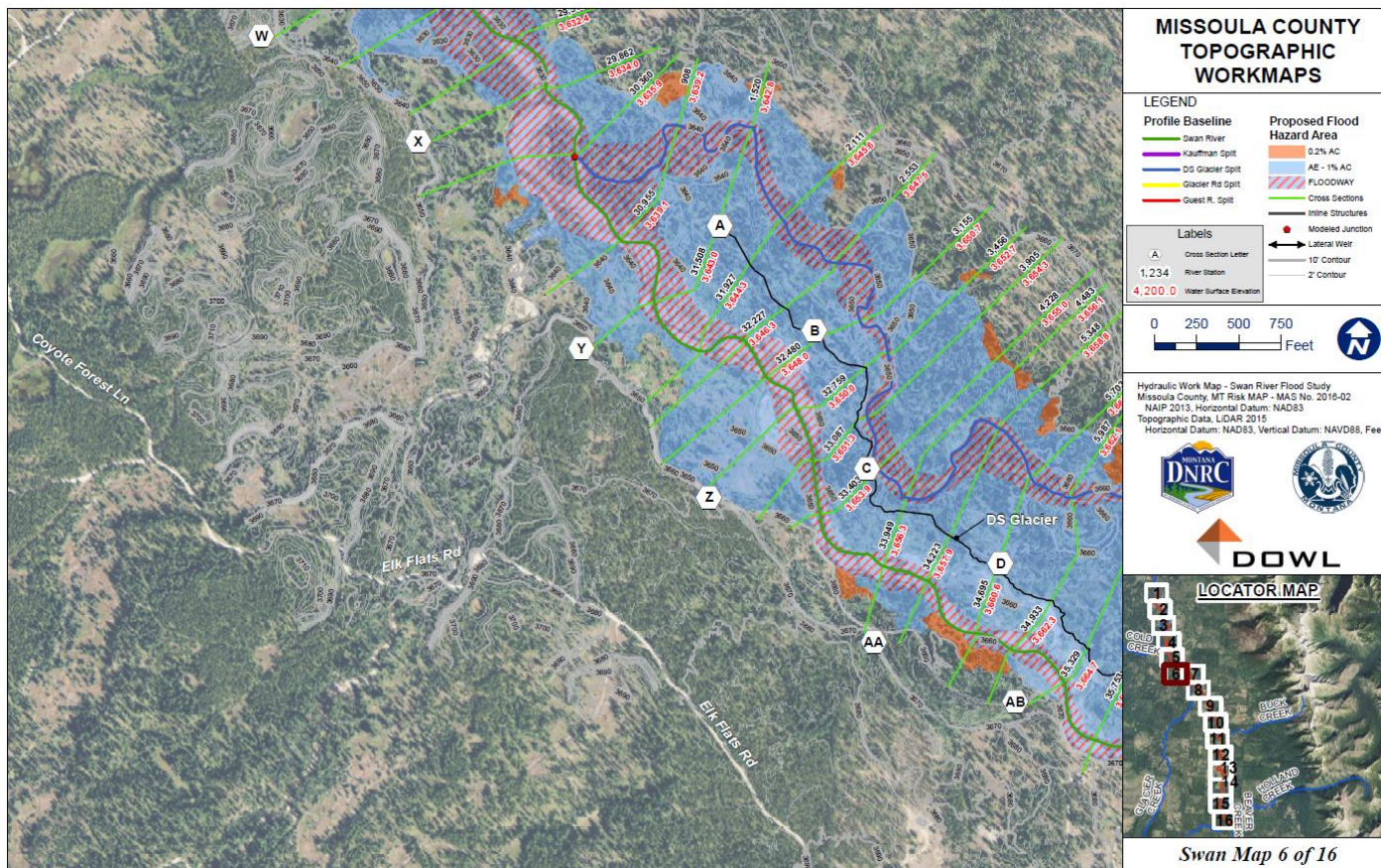
Hydraulic modeling (where the water will go when it overflows the channel) and engineering to produce draft maps.

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION



Hydraulic Analysis Report

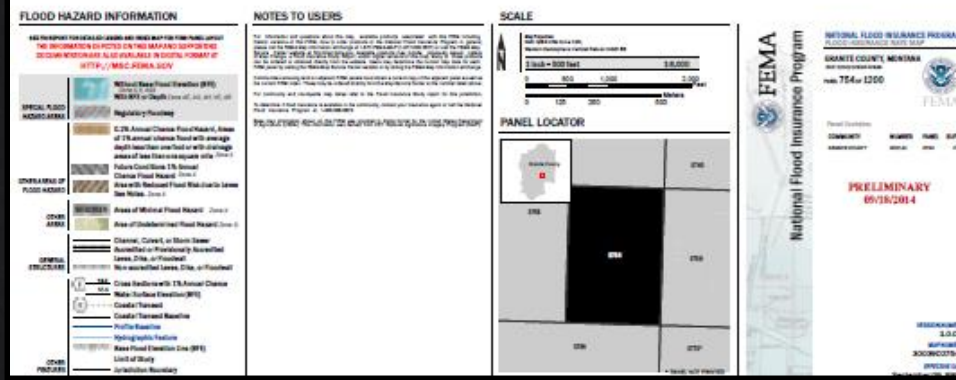
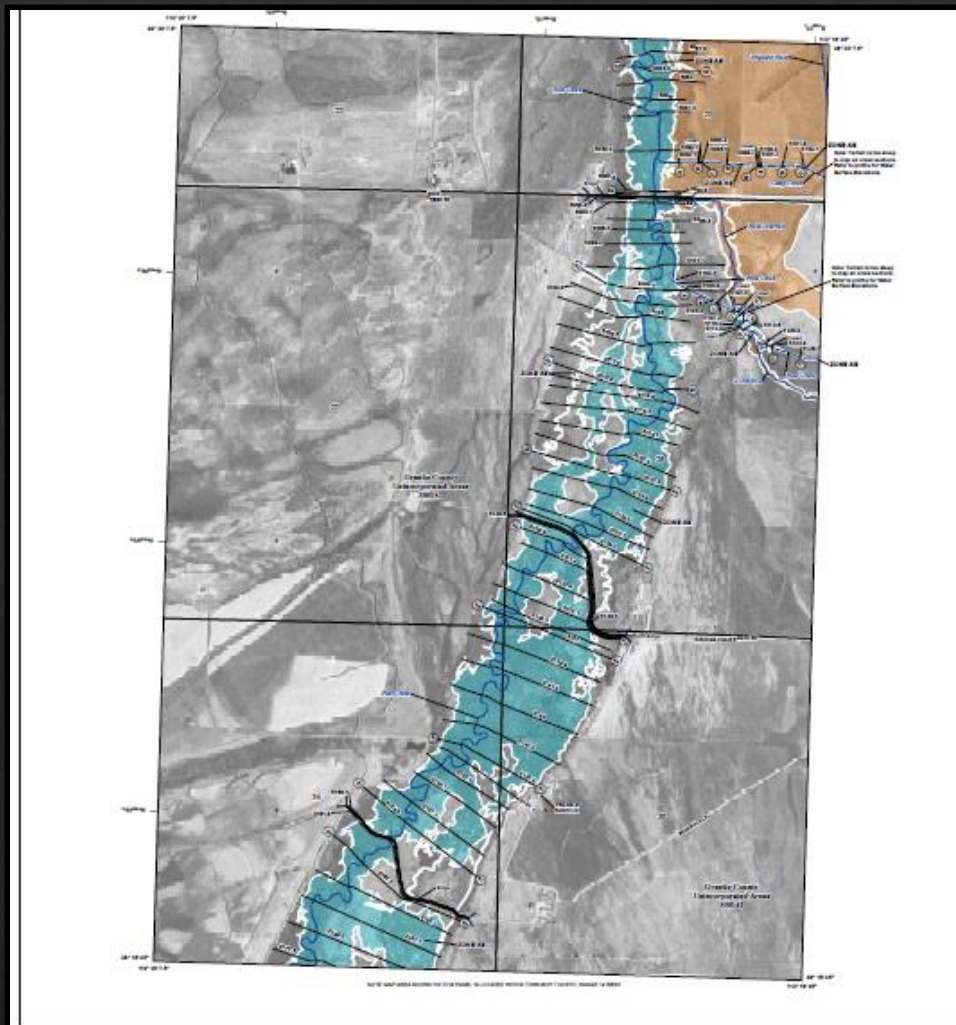
Swan River
Missoula County, MT
July 2016



Prepared For:
Montana Department of Natural Resources and Conservation
Water Resources Division
249 9th Avenue
Helena, MT 59620

Prepared By:
DOWL
2 North 32nd Street, Suite 700
Helena, MT 59101

- ◆ Preliminary Maps
- ◆ Public Review
- ◆ Maps Finalized



Estimated Project Schedule

Topographic (LiDAR) – Winter 2020

Survey Work- Summer 2020

Hydrology- Fall 2020

Hydraulics

Summer 2021

(Rock Creek & Bitterroot River)

Fall 2021

(Clark Fork River)

Draft Maps –late 2021 early 2022(est.)

Public review of draft maps – early to mid 2022 (est.)

FEMA Map Production/

Preliminary Maps - mid- late 2022 (est.)

Public review of preliminary maps – late 2022 (est.)

FEMA maps finalized – 2023 (est.)



Community
Contribution!!

Community Contribution

ATTENTION SWAN RIVER PROPERTY OWNERS in or near the FLOODPLAIN...

Missoula County is currently working with FEMA and Montana DNRC to update floodplain maps for the Swan River. FEMA's Preliminary Digital Flood Insurance Rate Maps (DFIRM) are intended to provide more reliable and detailed information about flood-prone areas along the Swan River. You are receiving this postcard because proposed floodplain mapping changes could affect your property.

www.missoulacounty.us/swanfp

Visit the County's website above to view FEMA's Preliminary DFIRM showing proposed floodplain changes and/or attend the public open house to get more information about this project.

PUBLIC OPEN HOUSE

Tuesday, June 20, 2017 | 6:00 p.m. - 7:00 p.m.
Swan Valley Community Hall | 6803 HWY 83N, Condon, MT

Staff from the DNRC Floodplain Program and Missoula County will be on hand during the meeting to answer questions and provide an overview of the project. We ask anyone with property adjacent to potential flood hazards to share information at the meeting. We are looking forward to meeting you there. For more information, contact Todd or Tiffany.

TIFFANY LYDEN
Missoula County Floodplain Administrator
Missoula County
missoulacounty.us
41

TIFFANY LYDEN
MT DNRC
tlyden@mt.gov
406.444.0599



Project Webpage

Carbon County Flood Maps Update

by **Nadene Wadsworth** — last modified Oct 17, 2019 01:18 PM — **History**

Background on the floodplain maps in the County:

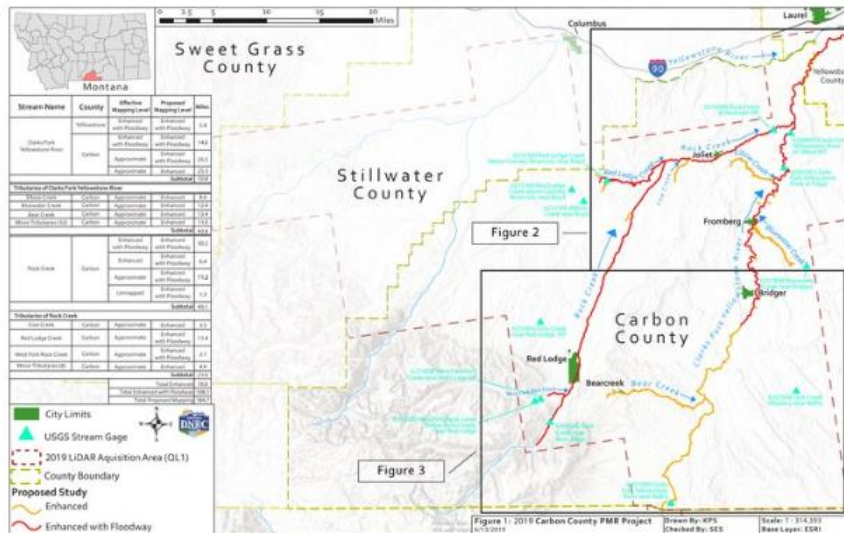
Carbon County floodplain maps were modernized through a Digitized Flood Insurance Rate Map (DFIRM) project in 2012. The maps were converted from paper to the digital environment. Most of the mapped floodplains in the county are still based off flood studies from the late 1970s and early 1980s. The 2012 DFIRM project entailed digital conversion of the effective floodplains in the county, with the exception of revised hydraulics and mapping on 9 miles of the Clarks Fork of the Yellowstone (upstream from the Carbon/Yellowstone County border). This revision, however, did not include updated hydrology or survey data. In 2017 a Partial Mapping Revision (PMR) was completed for the portion of the Yellowstone River in the county. The PMR leveraged US Army Corps of Engineers information from a Yellowstone River corridor study and updated floodplain mapping in Stillwater and Yellowstone Counties to update and replace the approximate floodplain mapping on the Carbon County side of the Yellowstone River with enhanced and floodway mapping.

2019 Project

DNRC with support from Carbon County applied and received a FEMA grant to update the flood study and floodplain maps for the Clarks Fork of the Yellowstone, Rock Creek, and tributaries.

DNRC held a project kick off meetings on October 3rd & 4th, 2019 with Carbon County, Joliet, Red Lodge, Bear Creek, and Fromberg. **To view the slides that were presented [click here](#).**

Below are the figures of the study extents for the project.



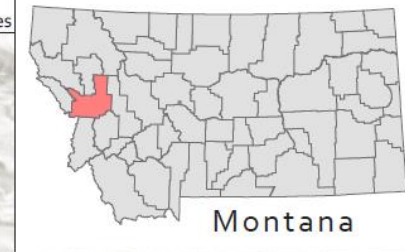
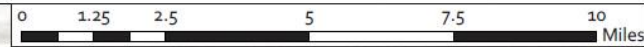
Project Points of Contact

Annie Gillespie
Carbon County Floodplain Administrator
(406) 445-7300
email

Tiffany Lyden
MT DNRC Outreach Specialist
(406)444-0599
email

Nadene Wadsworth
MT DNRC Outreach Specialist
(406)444-6732
email

Manage portlets



MISSOULA COUNTY

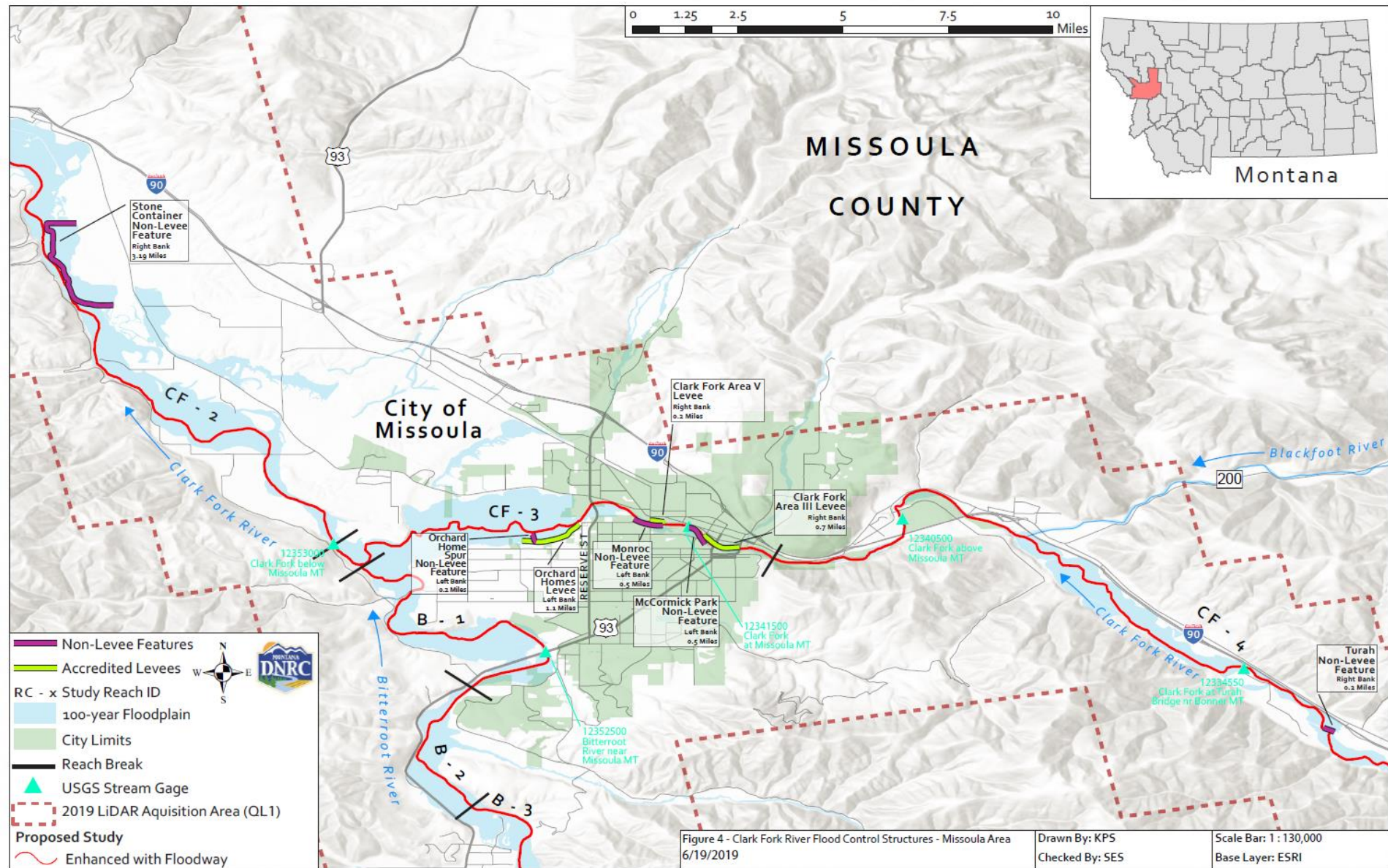


Figure 4 - Clark Fork River Flood Control Structures - Missoula Area
6/19/2019

Drawn By: KPS
Checked By: SES

Scale Bar: 1 : 130,000
Base Layer: ESRI



STEVE BULLOCK
GOVERNOR

DIRECTOR'S OFFICE (406) 444-2074
TELEFAX NUMBER (406) 444-2684

STATE OF MONTANA

WATER RESOURCES DIVISION (406) 444-6601
TELEFAX NUMBERS (406) 444-0533 / (406) 444-5918
<http://www.dnrc.mt.gov>

1424 9TH AVENUE
PO BOX 201601
HELENA, MONTANA 59620-1601

October 10, 2019

Missoula County Commissioner
David Strohmaier
199 W Pine St,
Missoula, MT 59802

Dear Commissioner Strohmaier:

The Department of Natural Resources and Conservation (DNRC) floodplain program and Missoula County have been collaborating to undertake a new flood hazard study for the Clark Fork, Bitterroot Rivers, and Rock Creek which will update the existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). FEMA recently awarded DNRC a grant to complete the project. Accordingly, we are beginning the process of scheduling community kickoff meetings and launching the initial project tasks.

The new study requires a review and assessment of any existing flood protection systems for the Clark Fork, Bitterroot Rivers, and Rock Creek. FEMA requires that Levee Sponsor/Owners provide engineering certification to ensure the levees are sound and to qualify for a reduced flood risk category on the landward side of the levee systems, in accordance with FEMA's accreditation requirements (44 CFR 65.10). DNRC has identified four levees that are owned and maintained by Missoula County: Orchard Homes, Turah, Orchard Homes Spur, and Stone Container (see attached figure). The existing status of these levees, based on the effective FIRMs is:

- The Orchard Homes levee show a reduced risk on the landward side of the levees based upon previous certification and FEMA accreditation,
- Turah, Orchard Homes Spur, and Stone Container levees do not show a reduced risk on the landward side of the levees and were not previously certified or accredited.

As the Owner/Sponsor of these levee systems, the county is responsible for providing all the necessary data, documentation, and certification (by a licensed professional engineer) to FEMA and DNRC, demonstrating that the levee systems comply with FEMA's minimum requirements for accreditation (per 44 CFR 65.10).

This letter serves as our formal request of the county's intent to pursue FEMA accreditation of the levee systems defined above.

The county may choose to pursue certification at the county's expense for potential accreditation by

FEMA. Accreditation status from FEMA will result in the levee showing reduced risk on the landward side of the levee system(s) on the future FIRMs. Residents that live behind an accredited levee may receive reduced flood insurance premiums.

The county may choose not to pursue certification/accreditation, which would result in a different flood mapping process. The levee would be modeled and potentially mapped as not reducing the risk on the landward side of the levee system(s). As a result, residents living behind non-certified/non-accredited levees that have a federally backed mortgage would be required to carry flood insurance at the high-risk premium.

Understanding the county's intent will help DNRC facilitate the flood study process along with coordinating the project schedule and study methods. Additionally, we request the county provide us with a designated point of contact for all levee related information and questions, as well as the contact information for whichever engineering firm the county may choose to work with, if certification/accreditation is the path forward. Should you have any questions, please contact Nadene Wadsworth at Nadene.wadsworth@mt.gov (406) 444-6732 or myself sestory@mt.gov (406) 444-6816.

For your convenience, we have prepared a sample 'letter of intent' template. If you could, please fill it out and return it to our office with all the information by February 28, 2020.

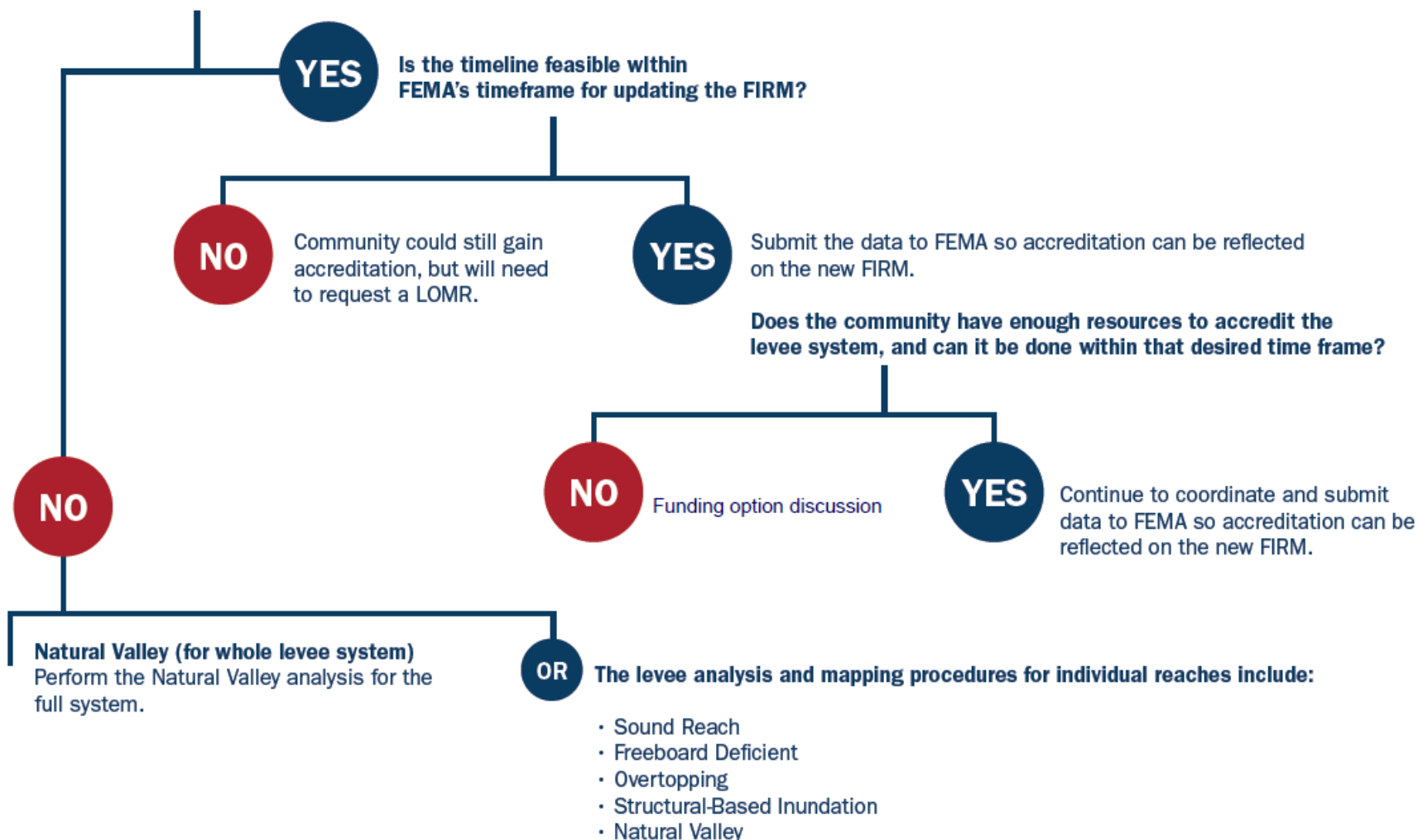
Thank you,

Steve Story, PE, CFM
Chief, Water Operations Bureau

cc: Shane Stack, Missoula County Public Works Director
Todd Klietz, Missoula County Floodplain Administrator
Larry Schock, DNRC regional engineer
Mark English, FEMA

Determining your path forward:

DO YOU INTEND TO ACCREDIT YOUR LEVEE SYSTEM?



Early 2022
(est)

Accredited Levee Integration
Into Mapping Project

Process as Map Revision
(at anytime)

Planning/
Scoping

Draft
Maps

Preliminary
Maps

Effective
Maps

Data Collection and Analysis

Appeal and Adoption Period

RISK MAP PROJECT TIMELINE

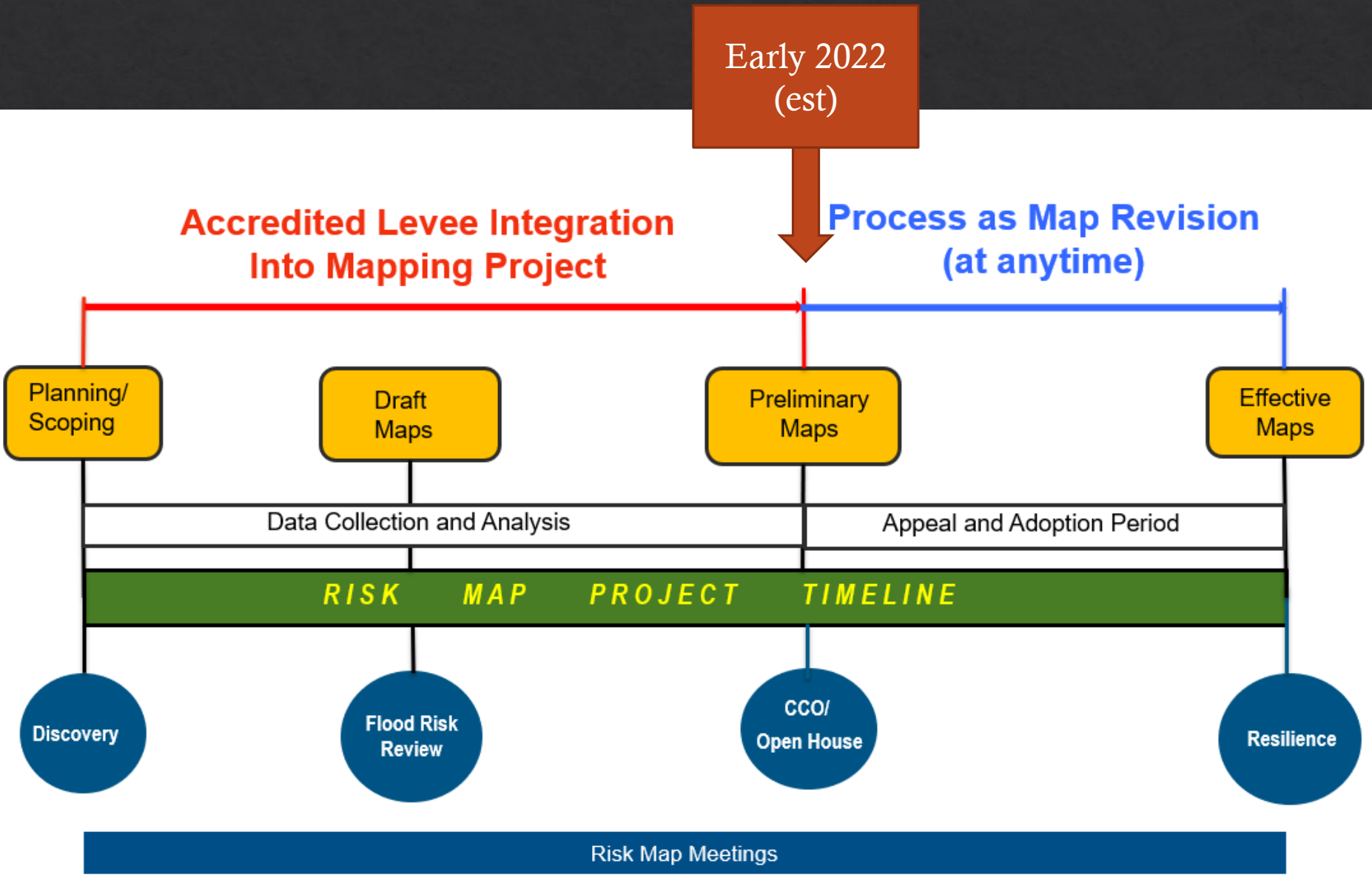
Discovery

Flood Risk
Review

CCO/
Open House

Resilience

Risk Map Meetings



Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps:

How-To Guide for Floodplain Managers and Engineers

The National Flood Insurance Program (NFIP) defines a levee system in Title 44, Chapter 1, Section 59.1 of the Code of Federal Regulations ([44 CFR 59.1](#)) as a flood risk reduction system that consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices to protect a hydraulically distinct area. Within the NFIP, a levee is a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

As part of the [flood mapping process](#), the Federal Emergency Management Agency (FEMA), and its State and local mapping partners, review and evaluate levee system data and documentation. Any community and/or other party seeking recognition or continued recognition of a levee system on a Flood Insurance Rate Map (FIRM) must provide FEMA with data and documentation, certified by a registered professional engineer, showing that the levee system is expected to provide 1-percent-annual-chance (base) flood risk reduction.

To be mapped on a FIRM as providing base flood risk reduction, levee systems must meet and continue to meet the NFIP minimum design, operation, and maintenance requirements described in Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations ([44 CFR 65.10](#)). FEMA has posted several guidance documents related to levee accreditation, mapping, and other topics. Please access the [Levee Resources Library](#) for updated guidance documents. To help clarify the responsibilities of community officials, levee owners, or other parties seeking recognition of a levee system identified during a study/mapping project, FEMA has posted several [guidance documents](#) related to levee accreditation, mapping, and other related topics. This document provides information regarding how FEMA maps levee systems, a checklist of the types of data and documentation that must be submitted for levee systems to be accredited on FIRMs, and an index of further resources.

A NOTE ABOUT FLOOD RISK AND FLOOD INSURANCE

Levee systems are designed to provide a specific level of protection. They can be overtopped or fail during flood events larger than those for which the system was designed. Levee systems also decay over time, which may increase the likelihood of failure. They require regular maintenance and periodic upgrades to retain their level of protection. When levees do fail, the resulting damage, including loss of life, may be much greater than if the levee system had not been built.

For all these reasons, FEMA strongly encourages people in levee-impacted areas to understand their flood risk, know and follow evacuation procedures, and protect their property by purchasing flood insurance, floodproofing their structure, or taking other precautionary measures. For more information on flood insurance, please visit [FloodSmart.gov](#).

RiskMAP
Increasing Resilience Together



Design Criteria		Section of the NFIP Regulations: 65.10(b)
Description: For levee systems to be accredited by FEMA, communities and/or levee owners must submit data and documentation to show that adequate design and operations and maintenance systems are in place to provide reasonable assurance that the levee has, and will continue to have, base flood risk reduction capability.		
Checklist for Design Criteria:		
<input type="checkbox"/>		Freeboard. The minimum freeboard required is 3 feet above the Base Flood Elevation (BFE) all along the length of the levee, with an additional 1 foot within 100 feet of structures (such as bridges) or wherever the flow is restricted, and an additional 0.5 foot at the upstream end of a levee. Levees impacted by coastal flooding have special freeboard requirements (see Paragraphs 65.10(b)(1)(iii) and (iv)).
<input type="checkbox"/>		Closures. All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.
<input type="checkbox"/>		Embankment Protection. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.
<input type="checkbox"/>		Embankment and Foundation Stability Analyses. Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (USACE) Engineer Manual 1110-2-1913, <i>Design and Construction of Levees</i> , (Chapter 6, Section II), may be used.
<input type="checkbox"/>		Settlement Analyses. Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in USACE Engineer Manual 1110-1-1904, <i>Soil Mechanics Design—Settlement Analysis</i> , must be submitted.

RISK MAPPING, ASSESSMENT, AND PLANNING PROGRAM (RISK MAP)

The Federal Emergency Management Agency's Risk MAP Program delivers quality data that increases public awareness and leads to action to reduce risk to life and property. Risk MAP is a nationwide program that works in collaboration with States, Tribes, and Local communities using best available science, rigorously vetted standards, and expert analysis to identify risk and promote mitigation action, resulting in safer, more resilient communities.

RiskMAP
Increasing Resilience Together





Thank
You

Tiffany Lyden
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Tlyden@mt.gov
(406) 444-0599

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MT DNRC
Nadene.Wadsworth@mt.gov
(406) 444-6732